22.0 OREGON COAST COHO SALMON ESU

22.1 BACKGROUND

22.1.1 Description of the ESU

All naturally produced coho salmon are included as part of the Oregon Coast coho salmon ESU. There are also seven hatchery stocks currently being propagated within the ESU. Of the seven, five were determined to be included in the Oregon Coast ESU (Table 22.1).

Table 22.1. List of preliminary natural populations of Oregon Coast coho salmon identified by the Oregon Coast coho TRT (Lawson *et al.* 2004), associated hatchery stocks, and description of the program.

Preliminary TRT populations (potentially or functionally independent)	Associated hatchery program (included, not included in the ESU)	Integrated or isolated program	Program description	Size of program (smolts)	Year in operation
Necanicum	none				
Nehalem	NF Nehalem (included)	Isolated	Harvest	200,000	1966
Tillamook Bay	Trask (not included)	Isolated	Harvest	200,000	1916
Nestucca	none				
Salmon	Salmon (not included)	Isolated	Harvest	200,000	1976
Siletz	Salmon (not included)	Isolated	Harvest	50,000	
Yaquina	none				
Beaver	none				
Alsea	none				
Siuslaw	none				
Siltcoos	none				
Tahkenitch	none				
Lower Umpqua	see Upper Umpqua				
Upper Umpqua	Cow (included)	Integrated	Harvest	60,000	1987
	Rock (included)	Integrated	Harvest	62,500	1920
Tenmile	none				
Coos Bay	Coos (included)	Integrated	Harvest	120,000	1981
Coquille	Coquille (included)	Integrated	Harvest	50,000	1979
Floras	none				
Sixes	none				

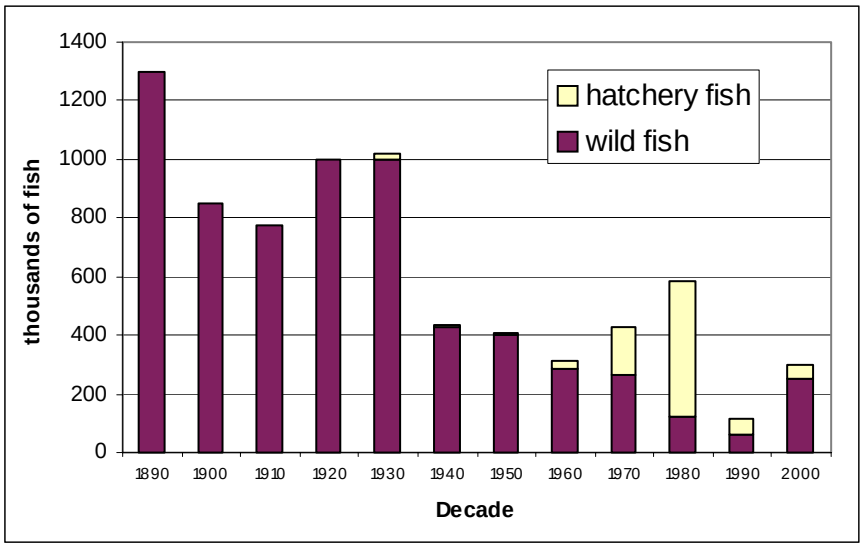
Summary: 19 functionally and potentially independent populations were designated by TRT. Five hatchery stocks included in the ESU. Two hatchery stocks not included in the ESU. Seven of the 19 populations have program influences. The total hatchery smolt production goal is 942,500 fish.

22.1.2 Status of the ESU

The BRT (2003) recommended a threatened listing for Oregon Coast coho salmon. There was concern regarding declines in productivity rates in recent years, with the 1994-1996 broodyears being the first time on record when coho did not replace themselves. Since 1999, with improved freshwater and ocean survival rates, there have been increases in abundance of the ESU, with substantial increases in the runs of the north coast rivers. The BRT also expressed concern about whether current habitat would be able to sustain coho populations when ocean survival decreases again in the future.

The BRT considered most, if not all, of the recent management changes for coho hatcheries in the ESU in their risk assessment of the ESU. They noted that many of the recent changes (e.g., elimination of some programs, reductions in hatchery fish releases, development of local broodstocks, marking of all fish) would presumably be positive for the conservation and recovery of natural populations. In the past, relatively high numbers of hatchery coho salmon were released throughout the Oregon Coast. The high numbers of hatchery fish presented significant genetic and ecological risks to the conservation of naturally produced fish in the ESU (Nickelson 2003).

Figure 22.1. Estimated preharvest abundance of hatchery and wild coho salmon destined for the Oregon Coast ESU.



22.2 ASSESSMENT OF HATCHERY PROGRAMS

22.2.1 Nehalem

22.2.1.1 Broodstock History. The current hatchery broodstock was founded from adult returns to the hatchery facility in the North Fork Nehalem and Fishhawk Creek (Nehalem basin). No natural coho salmon have been intentionally included in the broodstock since 1986. In recent years, the number of natural coho collected at the hatchery has been low; thus it is not likely that

substantial numbers of natural fish have been included in the broodstock over the years. ODFW is not currently incorporating natural fish into the broodstock (ODFW Nehalem HGMP 2001). This broodstock is managed in isolation from the natural population.

Table 22.2. Total number of coho salmon returning to the Oregon Coast coho salmon ESU. Only hatchery stocks included in the ESU are shown.

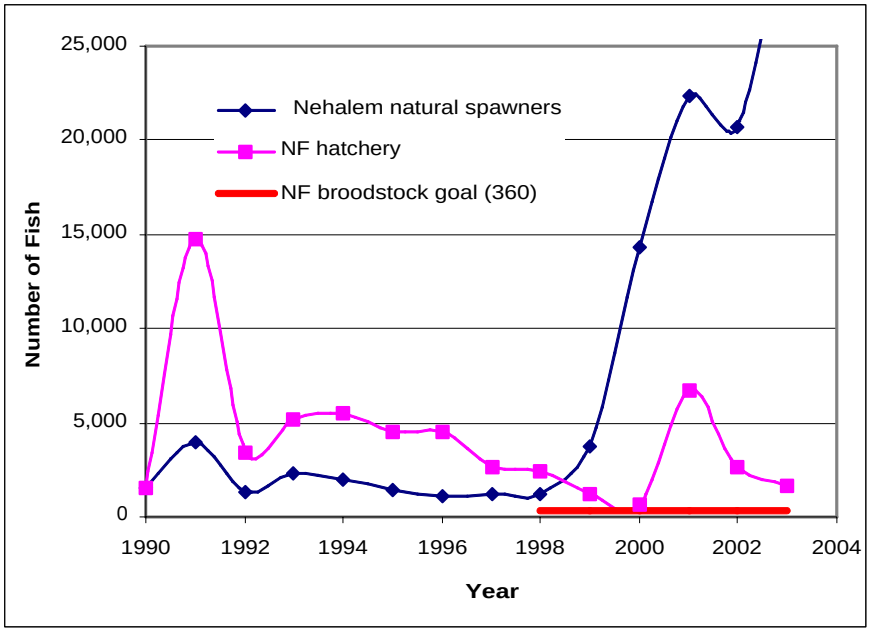
Year	Estimated number of natural-origin spawners	Estimated number of hatchery-origin fish (ESU stocks) returning to facilities	Total number of fish included in the ESU
1990	21,044	9,947	30,991
1991	38,152	32,072	70,224
1992	42,539	21,383	63,922
1993	55,423	16,376	71,799
1994	44,480	11,083	55,563
1995	54,089	11,062	65,151
1996	74,275	17,963	92,238
1997	23,580	10,601	34,181
1998	31,988	15,860	47,848
1999	48,862	6,471	55,333
2000	69,281	14,690	83,971
2001	170,719	25,466	196,185
2002	257,508	12,585	270,093
2003	241,992	7,513	249,505

22.2.1.2 Similarity between Hatchery-origin and Natural-origin Fish. North Fork Nehalem hatchery fish cluster genetically with other stocks that are part of the Oregon Coast ESU (Weitkamp *et al.* 1995). Information has been collected recently on natural fish in the Nehalem basin as part of the Oregon Plan monitoring, although this information has not been assessed with respect to the hatchery fish. The current broodstock was founded from the local population, although natural fish have not been intentionally incorporated into the broodstock since 1986. It is possible there could be substantial differences between the hatchery stock and local population.

22.2.1.3 Program Design. The program is intended to provide fish solely for commercial and recreational harvest. All of the releases are adipose fin-clipped. Program fish are not being used to supplement natural spawning, and in recent years, hatchery fish on the spawning grounds in the Nehalem basin has been less than 10 percent of the spawners since 1998 (Figure 22.3; OPSW 2002). The current program releases fewer than 200,000 smolts annually (more than a 50-percent reduction from releases in the early 1990s).

2.2.1.4 Program Performance. The program has returned sufficient numbers of fish to the hatchery to meet broodstock needs every year since 1990 (Figure 22.2). The smolt-to-adult survival rate for this program has ranged from 0.55 percent to 4.60 percent for broodyears 1985 to 1996, with an average of approximately 2 percent (ODFW Nehalem HGMP 2001). This program relies entirely on the State of Oregon for funding, which has been uncertain in recent years due to budget shortfalls.

Figure 22.2. Estimated number of natural-origin spawners, number of coho salmon collected at hatchery facilities, and the recent broodstock goal for the program.



22.2.1.5 VSP Effects

Abundance - From 1990 to 2003, the average number of natural fish spawning in the Nehalem basin was 7,700 fish (Figure 22.2; PFMC 2004). From 1970 to 2003, returns to the North Fork Nehalem hatchery facility have averaged more than 3,700 fish. In recent years, hatchery fish have made up less than 10 percent of the natural spawners in the Nehalem basin (OPSW 2002). This hatchery program provides more fish returning to the North Fork Nehalem but does not provide benefits to natural spawning. The program is being managed to isolate hatchery fish from the natural population. No natural fish are intentionally incorporated into the broodstock.

Productivity - Productivity rates (recruits per spawner) have averaged more than one for the hatchery program (Figure 22.2). Since few hatchery fish are spawning in the wild, the hatchery program has little to no effect on the productivity rate of the naturally spawning population. Nickelson (2003) showed productivity of natural coho populations to be negatively affected by hatchery programs on the Oregon Coast. Large numbers of hatchery fish attracted predators in the lower rivers and estuaries, causing higher mortality of natural-origin fish than would occur without a hatchery program. These productivity risks caused by the hatchery program have been reduced in recent years due to substantial reductions in the number of hatchery fish released into the Nehalem basin (down 66 percent from Nickelson's analysis).

Spatial Structure - Natural fish are widely distributed throughout the Nehalem basin. The hatchery facility is located on the North Fork Nehalem, a small tributary to the mainstem Nehalem River. An electric weir across the North Fork Nehalem at the hatchery that was in operation in the past may have adversely affected upstream migration of natural fish, thus changing the spawning distribution. The weir is no longer in operation. Hatchery fish are collected at the hatchery and upstream in a ladder trap at North Fork falls.

Diversity - Since few hatchery fish are spawning naturally, genetic introgression of hatchery fish into the natural population is presumed to be low. It is possible the hatchery fish have different life history characteristics than natural fish because the program is being managed in isolation (see above).

22.2.2 Tillamook Bay

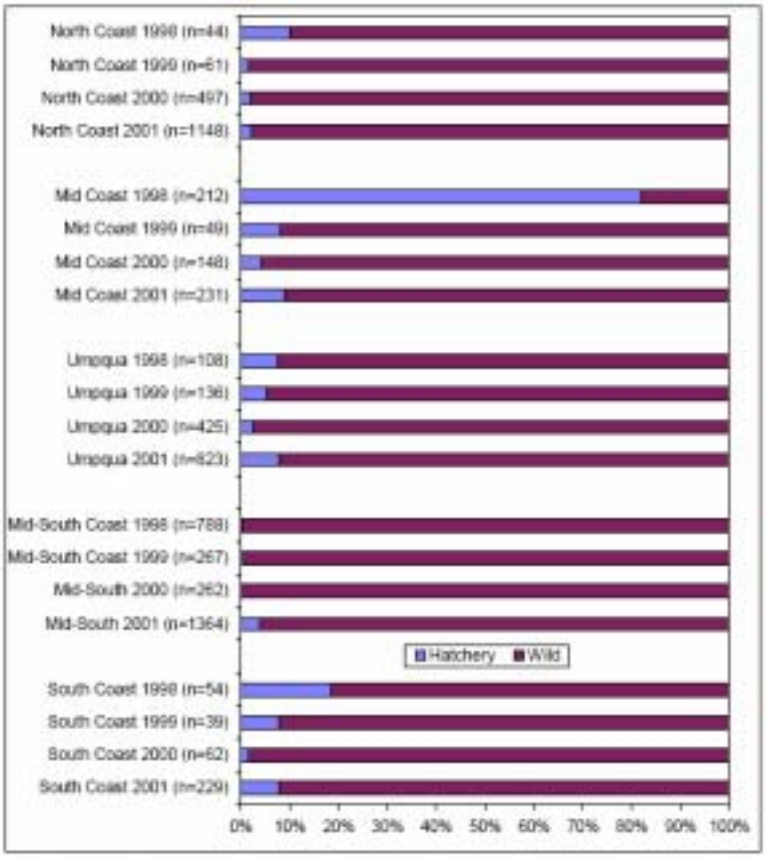
22.2.2.1 Broodstock History. The current broodstock has been collected from returns to hatchery traps in the Trask River since 1961. Prior to this, other stocks were imported into the hatchery program. No natural coho salmon have been intentionally included in the broodstock. In recent years, the number of natural coho collected at the hatchery has been low, so it is not likely substantial numbers of natural fish have been included into the broodstock over the years. ODFW is not currently incorporating natural fish into the broodstock (ODFW Trask HGMP 2001). This broodstock is managed in isolation from the natural population and is not included as part of the ESU.

22.2.2.2 Similarity between Hatchery-origin and Natural-origin Fish. Trask River hatchery fish cluster genetically with other stocks that are part of the Oregon Coast ESU (Weitkamp *et al.*

1995). Information has been collected recently on natural fish along the Oregon Coast as part of the Oregon Plan monitoring, although this information has not been assessed with respect to the hatchery fish. Since this hatchery stock was deemed not part of the ESU, there are likely significant differences between the hatchery stock and the local natural population.

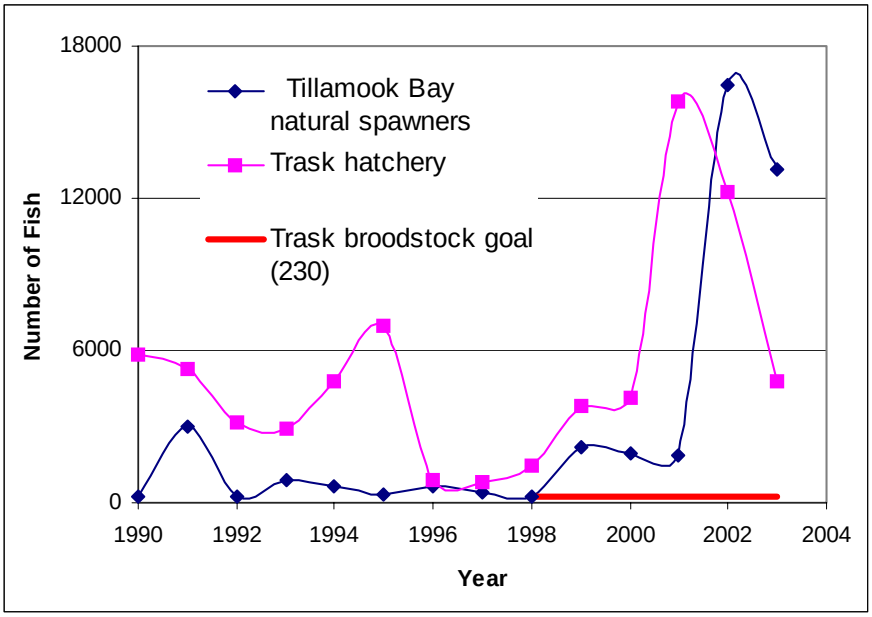
22.2.2.3 Program Design. The program is intended to provide fish solely for commercial and recreational harvest. All of the releases are adipose fin-clipped. Program fish are not being used to supplement natural spawning, and since 1998, hatchery fish on the spawning grounds have made up less than 10 percent of the spawners (Figure 22.3; OPSW 2002). The current program releases fewer than 200,000 smolts annually. Releases were more than one million smolts in the 1980s and early 1990s.

Figure 22.3. Proportion of hatchery and wild coho salmon estimated from spawning surveys. Taken from OPSW (2002).



22.2.2.4 Program Performance. The program has returned sufficient numbers of fish to the hatchery to meet broodstock needs every year since 1990 (Figure 22.4). The smolt-to-adult survival rate for this program has ranged from 0.47 percent to 2.96 percent for broodyears 1985 to 1996, with an average of approximately 1 percent (ODFW Trask HGMP 2001). This program relies entirely on the State of Oregon for funding, which has been uncertain in recent years due to budget shortfalls. In 2001, it was proposed that the program be terminated, but it has remained in place.

Figure 22.4. Estimated number of natural-origin coho spawners, number of coho salmon collected at the hatchery, and the current broodstock goal for the program.



22.2.2.5 VSP Effects

Abundance - From 1990 to 2003, the average number of natural fish spawning in the Tillamook Bay Basin (Miami, Kilchis, Wilson, Trask, and Tillamook rivers) was 2,900 (Figure 22.4; PFMC 2004). From 1970 to 2003, returns to the Trask hatchery averaged more than 4,400 fish. In recent years, hatchery fish have made up less than 10 percent of the natural spawners in the Tillamook Bay Basin (OPSW 2002). The program is being managed to isolate hatchery fish from the natural population. No natural fish are intentionally incorporated into the broodstock.

Productivity - Productivity rates (recruits per spawner) have averaged more than one for the hatchery program (Figure 22.4). Since few hatchery fish are spawning in the wild, the hatchery program has little to no effect on the productivity rate of the naturally spawning population.

Nickelson (2003) showed productivity of natural coho populations to be negatively affected by hatchery programs on the Oregon Coast. Large numbers of hatchery fish attracted predators in the lower rivers and estuaries, causing higher mortality of natural-origin fish than would occur without a hatchery program. These productivity risks caused by the hatchery program have been reduced in recent years due to substantial reductions in the number of hatchery fish released into the Trask basin (down 66 percent from Nickelson's analysis).

Spatial Structure - Natural fish have been widely distributed throughout the Tillamook Bay basin in recent years. The hatchery facility is located on the Trask River, one of the five tributaries to Tillamook Bay. No hatchery traps or weirs are known to adversely affect the spatial distribution of this population.

Diversity - Since few hatchery fish are spawning naturally, genetic introgression of hatchery fish into the natural population is presumed to be low. However, any hatchery fish spawning in the wild may pose a risk to the natural population because this hatchery stock is not part of the ESU. The hatchery stock has likely diverged from the local natural stock. Significant run timing differences between hatchery and natural fish have been observed in the past.

22.2.3 Salmon

22.2.3.1 Broodstock History. The current broodstock has been collected from returns to the Salmon River Hatchery. Smolts from this broodstock are released into the Salmon and Siletz rivers. No natural coho salmon have been intentionally included in the broodstock. The program is being managed as an isolated harvest program. This hatchery stock is not included as part of the ESU.

22.2.3.2 Similarity between Hatchery-origin and Natural-origin Fish. Salmon River Hatchery stock is not included as part of the ESU, because the stock was likely diverged from natural stocks in the ESU. It is not known what life history differences may exist between hatchery fish and the local population. Hatchery fish have strayed substantially into natural habitat in the past and made up over 90 percent of the spawners in the 1990s (ODFW Salmon HGMP 2001). The Salmon River population has most of the natural spawners of hatchery origin in the ESU (OPSW 2002).

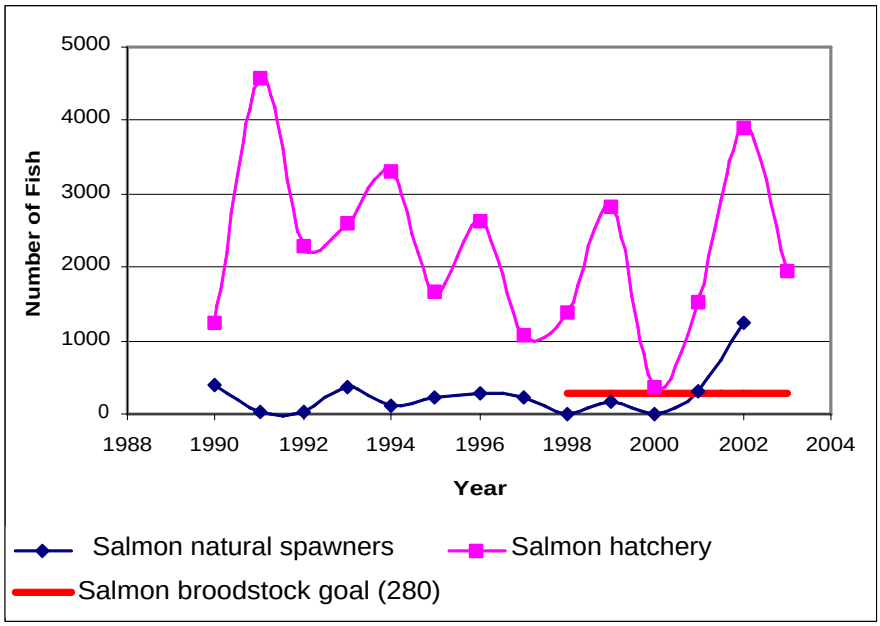
22.2.3.3 Program Design. The program is intended to provide fish solely for commercial and recreational harvest. All of the releases are adipose fin-clipped. Program fish are not being intentionally used to supplement natural spawning. However, uncontrollable numbers of hatchery fish have spawned naturally in the past (Figure 22.3; OPSW 2002). The current program releases fewer than 200,000 smolts annually.

22.2.3.4 Program Performance. The program has returned sufficient numbers of fish to the hatchery to meet broodstock needs every year since 1990 (Figure 22.5). The smolt-to-adult survival rate for this program has ranged from 0.50 percent to 1.51 percent for broodyears 1985 to 1996 (ODFW Salmon HGMP 2001). This program relies entirely on the State of Oregon for funding, which has been uncertain in recent years due to budget shortfalls. ODFW has stated that continuing this program is uncertain due to uncontrollable numbers of hatchery fish on the spawning grounds.

22.2.3.5 VSP Effects

Abundance - Natural fish returns to the Salmon River have been relatively low since 1990 (Figure 22.5). Hatchery fish spawners have made up over 90 percent of the natural spawning. This is of concern since the hatchery stock is not included in the ESU. It is unknown to what extent the natural population has been introgressed by Salmon River Hatchery stock. It is possible that offspring from naturally spawning hatchery fish make up most of the natural fish. The return of hatchery fish should decrease in the future, since releases have decreased from 1.5 million fish in the early 1990s to 200,000 fish currently.

Figure 22.5. Estimated number of natural-origin coho spawners, number of coho salmon collected at the hatchery, and the current broodstock goal for the program.



The returns of hatchery fish back to Salmon River Hatchery has exceeded broodstock needs every year since 1990. There is little risk of not attaining enough fish for broodstock, especially when only 280 fish are needed (Figure 22.5).

Productivity - Productivity rates (recruits per spawner) have averaged more than one for the hatchery program (Figure 22.5). There is concern over the high percentage of natural spawners that are non-ESU hatchery fish. The extent hatchery fish spawning overlaps with natural fish spawning is not known. It is possible hatchery fish are decreasing productivity of the natural population from genetic introgression with natural fish or competition for limited resources.

Nickelson (2003) showed productivity of natural coho populations to be negatively affected by hatchery programs on the Oregon Coast. Large numbers of hatchery fish attracted predators in the lower rivers and estuaries, causing higher mortality of natural-origin fish than would occur without a hatchery program. These productivity risks of the hatchery program have been reduced in recent years by substantial reductions in the number of hatchery fish released into the Salmon basin (down 33 percent from Nickelson's analysis).

Spatial Structure - The hatchery facility and weirs are not presently affecting the spatial structure of the natural population. An electric weir was used in the past to shunt fish into the hatchery for broodstock, but it is no longer in operation. Hatchery fish straying into the wild is high and likely results in significant genetic introgression with the few naturally-produced fish returning to the basin.

Diversity - It is likely the hatchery program has adversely affected the life history diversity that existed historically in this population. The high percentage of hatchery fish on the spawning grounds of a non-ESU stock likely has changed life history traits of the natural population. Hatchery fish run timing is significantly earlier than for natural fish.

22.2.4 Siletz

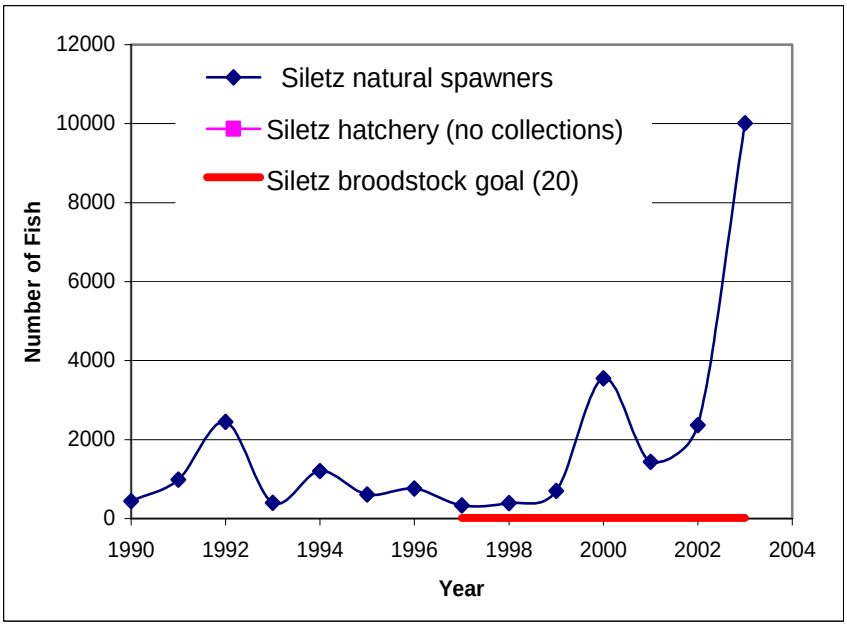
22.2.4.1 Broodstock History. The current program in the Siletz releases coho salmon smolts from broodstock collected in the Salmon River. Prior to 1986, coho salmon were collected at Siletz Hatchery. The Salmon River stock is not included as part of the ESU. The broodstock is isolated from the natural population in the Salmon River.

22.2.4.2 Similarity between Hatchery-origin and Natural-origin Fish. See Salmon River description above.

22.2.4.3 Program Design. The purpose of this program is to provide fish for recreational and Tribal harvest. Total releases of coho smolts are currently 50,000 fish. All fish are adipose fin-clipped. Hatchery fish made up most of the natural spawners in the basin when large numbers of hatchery fish were released in the Siletz River. It is expected a few hundred hatchery fish will return under the current smolt release (ODFW Siletz HGMP 2001). This should result in 10 percent of the spawning population being hatchery fish (Figure 22.5).

22.2.4.4 Program Performance. See Salmon River above.

Figure 22.6. Estimated number of natural-origin coho spawners, number of coho salmon collected at the hatchery, and the current broodstock goal for the program.



22.2.4.5 VSP Effects

Abundance - The current program should result in only a few hundred fish returning to the Siletz River. Recent returns of natural fish have numbered in the thousands of fish, with the estimated number of spawners in 2003 being 10,000 natural fish (Figure 22.5). There appears to be little benefit of the hatchery program to the abundance of the Siletz population.

Productivity - Given the relatively low number of fish released in the Siletz basin, it is likely the program would not have a significant effect on the productivity of the population. However, if even a few hatchery fish spawn with natural fish, there is a potential for decreased productivity, since hatchery fish are diverged from the natural population in the ESU.

Spatial Structure – There is little to no effect of hatchery facilities on the Siletz population is anticipated. Broodstock are collected out-of-basin in the Salmon River.

Diversity – There is little to no effect on the natural diversity of the Siletz population is likely, since few hatchery fish are interacting with natural fish. Release numbers are relatively low.

22.2.5 Upper Umpqua

22.2.5.1 Broodstock History. There are two hatchery programs in the Upper Umpqua population. The Cow Creek program collects broodstock from returns to the base of Galesville Dam (located on Cow Creek in the South Umpqua basin). The Rock Creek program collects broodstock at Winchester Dam and from returns back to Rock Creek Hatchery (North Umpqua River basin). Both programs have incorporated natural fish into the broodstocks recently. The management goal is for at least 50 percent of the broodstock to comprise natural fish (ODFW Umpqua HGMP 2003).

22.2.5.2 Similarity between Hatchery-origin and Natural-origin Fish. Genetic analyses indicate that both hatchery stocks cluster with other coho stocks in the Umpqua basin and the Oregon Coast ESU (Weitkamp *et al.* 1995; Lawson *et al.* 2004). It is likely the existing hatchery stocks show some resemblance to their respective natural runs, since the management goal is for at least 50 percent of the broodstock to comprise natural fish.

22.2.5.3 Program Design. Both programs are designed to provide fish for harvest. The Cow Creek program, partially funded by Douglas County to mitigate for fishery losses associated with Galesville Dam, releases 60,000 smolts annually. The Rock Creek program is funded entirely by the State of Oregon and currently releases 62,500 fish. The Rock Creek program also outplants coho fry into tributaries of the mainstem Umpqua River to supplement natural production (approximately 400,000 fry per year).

22.2.5.4 Program Performance. The programs have returned sufficient numbers of fish to the hatchery collection facilities to meet broodstock needs every year since 1990 (Figure 22.7). The smolt-to-adult survival rate for the Rock Creek program has ranged from 0.44 percent to 3.58 percent for brood years 1985 to 1996, with an average of approximately 1 percent (ODFW

Umpqua HGMP 2003). It is expected the Cow Creek program would have similar survival rates. The number of hatchery fish on the spawning grounds throughout the Umpqua Basin in recent years has been less than 10 percent (Figure 22.3; OPSW 2002). However, the North Umpqua Basin is not surveyed as part of the Stratified Random Sampling survey done by ODFW. Counts of hatchery and natural fish are available at Winchester Dam. Hatchery fish have outnumbered natural fish at Winchester Dam since 1982 (ODFW Umpqua HGMP 2003). It is not known how many of these hatchery fish end up on the spawning grounds. Douglas County funds the Cow Creek program as mitigation for Galesville Dam. Continued funding is certain. Funding for the Rock Creek program has been uncertain in recent years due to Oregon budget shortfalls. This program was proposed for elimination in 2001 but is currently still in operation.

22.2.5.5 VSP Effects

Abundance - Natural fish spawning throughout the Umpqua basin increased substantially from 2001 through 2003 compared to the 1990s (Figure 22.7). However, given the estimated number of miles available for coho spawning in the Umpqua basin (1,083 miles), this area had the lowest density of spawners in the ESU in 2003 (PFMC 2004). Adipose fin-clipped hatchery fish have made up less than 10 percent of the natural spawners in the South Umpqua and main Umpqua basins in recent years (ODFW Corvallis research website May, 2004 http://oregonstate.edu/Dept/ODFW/). The North Umpqua basin is not surveyed as part of the coast-wide spawning surveys, so estimates of the number of hatchery fish spawning naturally are not available. The Rock Creek program also releases approximately 400,000 unfed fry into mainstem Umpqua tributaries for supplementation. Since these fish are not adipose fin-clipped, it is unknown what contribution these program fish are having on natural spawning.

Since hatchery coho salmon releases have been reduced in the Umpqua basin in recent years, and the number of hatchery fish spawning naturally has also decreased, the programs are not contributing much to the abundance of naturally spawning fish. The exception is the unfed fry program, but the number of adult spawners from this program is unknown.

The Cow Creek and Rock Creek hatchery programs have returned sufficient numbers of fish to exceed broodstock needs (Figure 22.7). Both programs need a total of approximately 920 fish for broodstock. The average number of hatchery fish crossing Winchester Dam on the North Umpqua River has been 6,000 fish each year from 1990 to 2002 (Figure 22.7). There appears to be little risk of not attaining sufficient returns for broodstock under the current production levels.

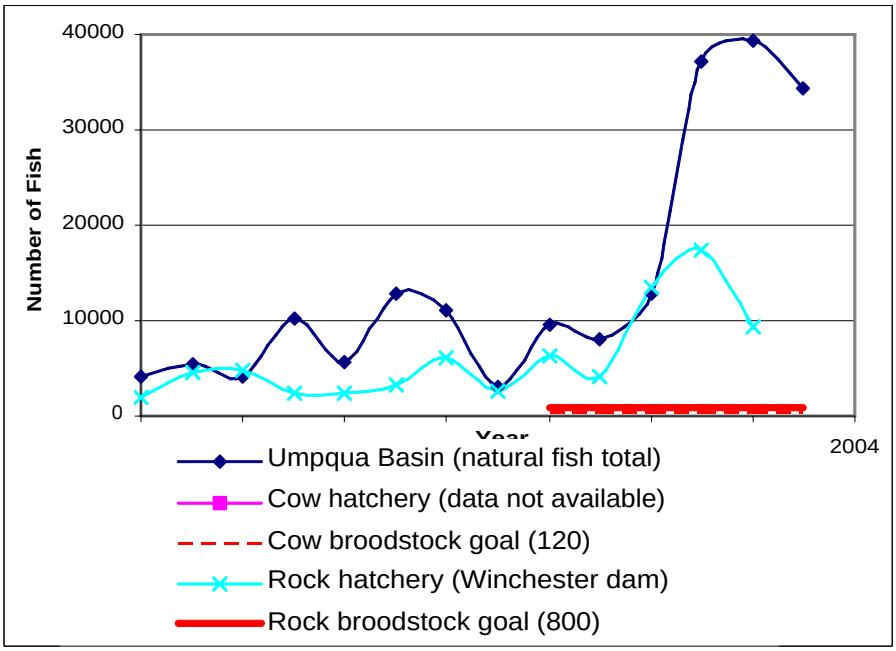
Both of these programs have incorporated natural fish into the broodstock in recent years. Since the hatchery stocks are integrated with the natural population, these programs provide a genetic reserve that could be used for recovery efforts in case the natural population decreases to very low abundances. The Cow Creek stock also likely resembles the remnant run of coho salmon that was blocked by the construction of Galesville Dam on Cow Creek, a tributary to the South Umpqua River.

Productivity - It is not known what effects the hatchery programs may be having on the productivity of the lower Umpqua and upper Umpqua populations. Information is lacking on the

proportion of hatchery fish on the spawning grounds in the North Umpqua basin and adult returns from the unfed fry releases.

Spatial Structure - Rock Creek Hatchery, located on a tributary of the lower North Umpqua River is the only hatchery facility currently in operation in the Umpqua basin. Other collection traps are distributed in other areas, but these traps are associated with other programs (e.g., dams). The water intake structure and fish ladder at Rock Creek Hatchery inhibits upstream migration of coho salmon. Some coho salmon do migrate upstream, but passage conditions at the structure are poor. Approximately 10 to 20 miles of coho salmon habitat is upstream of the ladder.

Figure 22.7. Estimated number of natural-origin spawners, number of coho salmon collected at the hatchery, and the current broodstock goal for the program.



Diversity - It is not clear what effects the hatchery programs may be having on the diversity of the natural populations. Large-scale releases of unfed fry from the North Umpqua River stock into mainstem Umpqua tributaries are of particular concern. These hatchery fish may out-compete the naturally produced juveniles co-occurring in the streams, especially given the unnaturally high densities of stocked fry.

The potential genetic effects from hatchery fish spawning in the wild are likely to be low in the South Umpqua basin, since few hatchery fish have been observed recently (Figure 22.3; ODFW Corvallis research Web site May, 2004 http://oregonstate.edu/Dept/ODFW/). In the mainstem Umpqua and North Umpqua, the extent of natural spawning by hatchery fish is unknown.

22.2.6 Coos Bay

22.2.6.1 Broodstock History. The current hatchery program collects broodstock from local returns to the Coos basin. The management goal is for at least 30 percent of the broodstock to be made up of natural fish (ODFW Coos HGMP 2001). This hatchery stock is integrated with the local natural population and is included as part of the ESU.

22.2.6.2 Similarity between Hatchery-origin and Natural-origin Fish. The hatchery stock clusters genetically with other coho stocks in the ESU (Weitkamp *et al.* 1995; Lawson *et al.* 2004). It is likely the existing hatchery stock shows some resemblance to the natural run, since the management goal is for 30 percent of the broodstock to be made up of natural fish.

22.2.6.3 Program Design. The program is designed to provide fish for harvest. Coho salmon smolts (120,000) are released into Isthmuth Slough (a terminal fishery area with little natural production), so that hatchery fish can be targeted with minimal effects on other adjacent natural runs.

22.2.6.4 Program Performance. The programs have returned sufficient numbers of fish to the hatchery collection facilities to meet broodstock needs every year since 1990 (Figure 22.8). The smolt-to-adult survival rates for the Coos program has ranged from 0.26 percent to 6.67 percent for broodyears 1985 to 1996, with an annual average of approximately 2 percent (ODFW Coos HGMP 2001). The number of hatchery fish on the spawning grounds throughout the Coos basin in recent years has been less than 10 percent (OPSW 2002). The State of Oregon funds this program, and funding has been uncertain due to recent budget shortfalls.

22.2.6.5 VSP Effects

Abundance - The number of natural fish spawning throughout the Coos basin has improved in recent years (Figure 22.8). Spawning surveys have shown hatchery fish to represent less than 10 percent of the spawning population (Figure 22.3). The releases of hatchery fish in the Coos basin are designed to return fish to a terminal area where little natural production occurs so that natural fish can be avoided. It is unknown if the unharvested hatchery returns stray to other areas and spawn, or if their spawning success is poor in the terminal area.

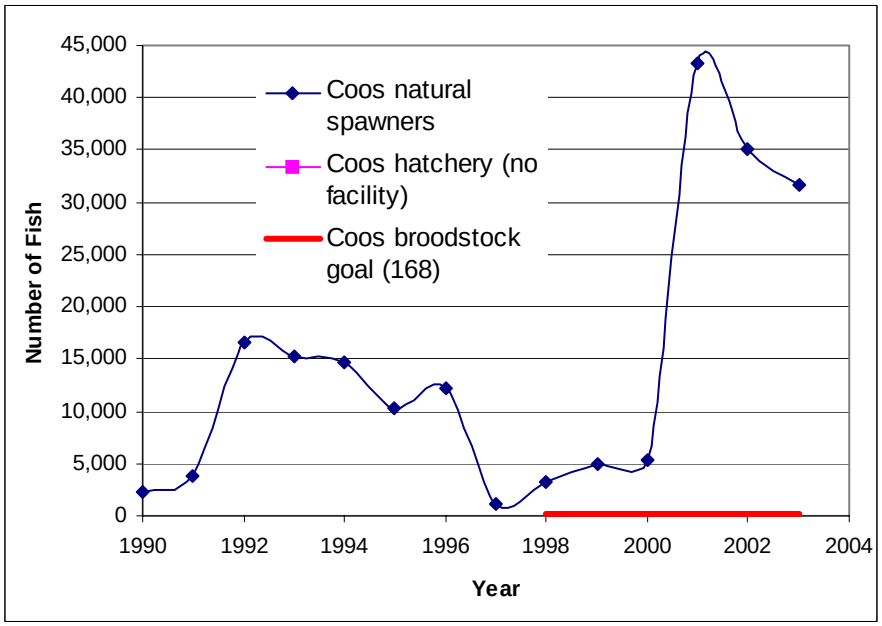
Sufficient numbers of broodstock are collected every year for this program, mainly because natural fish are collected from traps operated throughout the basin. Since natural fish have been incorporated into the broodstock on a regular basis, the program could be considered a genetic reserve used for recovery efforts if the natural population were to collapse. However, there are concerns whether this program would be an appropriate reserve, given the small size of the program (see below).

Productivity - Given the relatively low number of fish released in the Coos basin, it is likely the program would not have a significant effect on the productivity of the population, especially given the high number of natural spawners (over 30,000 in 2001-2003; Figure 22.8).

Spatial Structure - Hatchery facilities located in the Coos basin have little to no effect on the spatial structure of the natural population. Several satellite trapping facilities are present in the basin, but they are only operated periodically to collect broodstock. Juvenile hatchery fish are reared at other hatchery facilities.

Diversity - The hatchery program incorporates natural coho into the broodstock on a regular basis. The intent is to collect broodstock throughout the breadth of the natural coho run. However, since only 168 fish are needed for broodstock, it is not known if the program adequately reflects the diversity of the natural run (which has exceeded 30,000 fish in recent years). It seems possible that the program might only represent some portions of the natural run, at best.

Figure 22.8. Estimated number of natural-origin coho spawners, number of coho salmon collected at the hatchery, and the current broodstock goal for the program.



22.2.7 Coquille

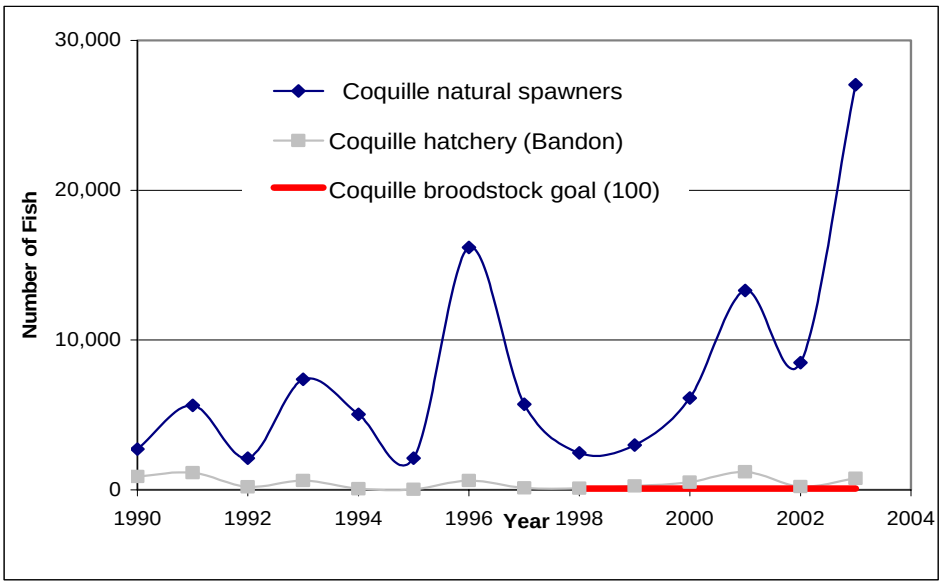
22.2.7.1 Broodstock History. The current hatchery program collects broodstock from local returns to the Coquille basin. The management goal is for at least 30 percent of the broodstock to be made up of natural fish (ODFW Coquille HGMP 2001). This hatchery stock is integrated with the local natural population and is included as part of the ESU.

22.2.7.2 Similarity between Hatchery-origin and Natural-origin Fish. Specific genetic information for this hatchery stock is not available. It is likely the existing hatchery stock shows some resemblance to the natural run, since the management goal is for at least 30 percent of the broodstock to be made up of natural fish.

22.2.7.3 Program Design. The program is designed to provide fish for harvest. Coho salmon smolts (50,000) are released into two small tributaries near the estuary. All of the releases are adipose fin-clipped. Hatchery fish have represented less than 10 percent of the spawners in the Coquille basin in recent years (OPSW 2002).

22.2.7.4 Program Performance. The programs have returned sufficient numbers of fish to the hatchery collection facilities to meet broodstock needs every year since 1990 (Figure 22.9). The smolt-to-adult survival rate for the Coquille program has ranged from 0.04 percent to 3.37 percent for broodyears 1985 to 1996, with an average of approximately 0.75 percent (ODFW Coquille HGMP 2001). The number of hatchery fish on the spawning grounds throughout the Coquille basin in recent years has been less than 10 percent (OPSW 2002). The State of Oregon funds this program, and funding has been uncertain due to recent budget shortfalls.

Figure 22.9. Estimated number of natural-origin coho spawners, number of coho salmon collected at the hatchery, and the current broodstock goal for the program.



22.2.7.5 VSP Effects

Abundance - The number of natural fish spawning throughout the Coquille basin has improved in recent years (Figure 22.9). Spawning surveys have shown hatchery fish to represent less than 10 percent of the spawning population (Figure 22.3). The total release of hatchery coho in the Coquille Basin is relatively low (50,000 fish currently). Given these low numbers, adult returns are also low compared to returns of natural fish. The hatchery program is providing little benefit to the abundance of the naturally spawning component of the population.

Sufficient numbers of broodstock are collected annually to maintain this program under the current production goals. Hatchery fish are collected from returns to Bandon Hatchery. Natural

coho are also collected from various trapping facilities throughout the basin and incorporated into the hatchery broodstock.

Productivity - Given the relatively low number of fish released in the Coquille basin, it is likely the program would not have a significant effect on the productivity of the population, especially given the high number of natural spawners (Figure 22.9).

Spatial Structure - Bandon Hatchery is located on a small tributary to the lower Coquille River. The hatchery has an impassable weir that diverts fish returns to the hatchery (ODFW Coquille HGMP 2001). The spawning habitat above the weir represents a small fraction of the habitat available for coho salmon in the basin (probably less than 1 percent).

Diversity - The hatchery program incorporates natural coho into the broodstock on a regular basis. The intent is to collect broodstock throughout the breadth of the natural coho run. However, since only 100 fish are needed for broodstock, it is not known if the program adequately reflects the diversity of the natural run (which has exceeded 10,000 fish in recent years). It is possible that the program only represents certain portions of the natural run, at best.

22.3 CONCLUSION

Existing Status: Threatened
BRT Finding: Threatened
Recommendation: Threatened

22.3.1 ESU Overview

22.3.1.1 History of Populations

The Oregon Coast Technical Recovery Team identified 67 historic populations within the Oregon Coast coho salmon ESU (Lawson *et al.* 2004; co-manager review draft). Nineteen of the 67 populations were classified as Functionally or Potentially Independent Populations. The remaining 48 populations were classified as Dependent Populations that probably experienced periodic extinction and re-colonization events on a timeframe of 100 to 1000 years.

22.3.1.1 Association between Natural Populations and Artificial Propagation

Natural populations "with minimal genetic contribution from hatchery fish"

Of the 19 Functionally Independent and Potentially Independent Populations classified in the ESU, 12 have minimal genetic contribution from hatchery fish, because no programs are currently being operated within the geographic boundaries of these natural populations. Of the remaining seven populations, in the last few years hatchery fish have made up less than 10 percent of the natural spawners in all of the populations except one (Salmon River).

Natural[a] populations "that are stable or increasing, are spawning in the wild, and have adequate spawning and rearing habitat" [b]

All of the Functionally Independent and Potentially Independent Populations have increasing trends in abundance over the last five years. However, the long-term trends over the last 100 years are negative for all of these natural populations. The BRT (2003) expressed concern about whether current habitat conditions within the ESU could sustain the coho populations through another episode of poor ocean survival.

Mixed (Integrated Programs[c])

North Fork Nehalem, Rock, Cow, Coos, Coquille hatchery stocks.

Hatchery (Isolated[d])

Trask and Salmon hatchery stocks.

22.3.2 Summary of ESU Viability

Abundance

The lowest risk factor for this ESU was in the abundance category (BRT 2003). The number of natural-origin coho salmon spawners increased substantially from 2001 through 2003 compared to the lowest counts on record in the 1990s. Since the number of hatchery coho programs and the total number of hatchery fish released has been reduced substantially in recent years, hatchery fish have made up less than 10 percent of the fish on the spawning grounds since 1999.

Productivity

The highest risk factor for this ESU is low productivity (BRT 2003). For the first time on record since 1950, the 1997-1999 returns of coho salmon did not replace themselves. Productivity rates in subsequent broodyears have increased due to increased survival rates. The long-term productivity rate trend for the ESU is negative. The BRT (2003) expressed concern whether coho salmon populations would be able to sustain themselves

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[a] See HLP for definition of natural, mixed and hatchery populations

[b] HLP Point 3

[c] Integrated programs follow practices designed to promote and protect genetic diversity and only use fish from the same local population for broodstock (both natural-origin fish, whenever possible, and hatchery-origin fish derived from the same local population and included in the ESU). Programs operated to protect genetic diversity in the absence of natural-origin fish (e.g., captive broodstock programs and the reintroduction of fish into vacant habitat) are considered "integrated".

[d] Isolated programs do not follow practices designed to promote or protect genetic diversity. Fish that are reproductively isolated are more likely to diverge genetically from natural populations included in the ESU and to be excluded themselves from the ESU.

under current habitat conditions during the next cycle of poor ocean conditions.

In recent years, since hatchery fish make up less than 10 percent of the natural spawners, and hatchery smolt production goals are not likely to increase in the near future, hatchery fish are not likely to increase the productivity of coho salmon in the wild. There are no known data indicating hatchery programs have changed ESU productivity.

Spatial Structure

In recent years, natural-origin coho salmon have been widely distributed and spawning throughout the ESU. Hatchery fish are not being used to reintroduce fish into unoccupied habitat. Operation of the hatchery facilities has a negligible effect on the overall distribution and migration of juvenile and adult coho salmon in the ESU.

Diversity

Integrated propagation programs in the Coquille, Coos, and Upper Umpqua basins are being managed as wild broodstocks that resemble natural fish to the extent possible. The N. Nehalem program is an isolated program that has not incorporated natural fish into the broodstock on a regular basis. There may be localized detrimental effects of the hatchery programs depending on the location and extent to which hatchery fish are spawning naturally.

22.3.3 Artificial Propagation Record

Experience with Integrated Programs

The Coquille, Coos, Rock, and Cow hatchery stocks are integrated with natural origin coho salmon. All of these programs have been in operation for more than a decade.

Are Integrated Programs Self-Sustaining

The Coquille, Coos, Rock, and Cow hatchery stocks have exceeded broodstock goals nearly every year since the programs were initiated. Spawner-to-spawner replacement rates have averaged more than one since the programs have been in operation.

Certainty that Integrated Programs will Continue to Operate

All of the integrated programs are funded by the State of Oregon, with the exception of the Cow Hatchery program. In recent years, continuation of these programs has been uncertain due to budget shortfalls. Monitoring and evaluation supporting effective adaptive management are strengths of these propagation programs.

22.3.4 Summary of Overall Extinction Risk Faced by the ESU

Recent improvements in spawner abundance from 2001 through 2003 have decreased the extinction risk of the ESU. However, recent abundances are still probably less than 25 percent of historical abundances (BRT 2003). The primary concern is declining productivity throughout the ESU. If habitat conditions continue to degrade, it is doubtful the ESU would be able to sustain itself during poor survival episodes in the future. The current hatchery programs are providing some benefit to the abundance in the southern areas of the ESU (Coquille, Coos, and Upper

Umpqua population). The majority of the areas do not have any associated hatchery programs.

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